

REMARKS

The present application was filed on August 22, 2003 with claims 1-34. Claims 24-34 have been withdrawn from consideration in response to a restriction requirement. Therefore, claims 1-23 are presented herein for examination on the merits. Applicant acknowledges that while claims 24-34 have been withdrawn from consideration, as highlighted above, these claims are still pending in the present application.

In the outstanding Office Action, the Examiner rejected claim 1-23 under 35 U.S.C. §112, second paragraph, as allegedly being indefinite for failing to particularly point out and distinctly claim the subject matter of the invention. The Examiner further rejected claims 1-3, 5-12, 15, 16 and 23 under 35 U.S.C. §103(a) as allegedly being unpatentable over Apen et al (US 2003/0017635 A1) (hereinafter "Apen").

The present invention provides antireflective hardmask compositions and techniques for the use of antireflective hardmask compositions for processing semiconductor devices. The antireflective hardmask layer comprises a carbosilane polymer backbone comprising at least one chromophore moiety, at least one transparent moiety and a crosslinking component. The carbosilane polymer may comprise any combination of an acid generator, an SiO-containing unit and an additional crosslinking component.

FORMAL REJECTIONS

As mentioned above, the Examiner rejected claim 1-23 under 35 U.S.C. §112, second paragraph, as allegedly being indefinite for failing to particularly point out and distinctly claim the subject matter of the invention. Specifically, the Examiner highlighted the language "a carbosilane polymer backbone comprising... at least one transparent moiety" in independent claims 1 and 23. The Examiner stated, with regard to claims 1 and 23, that "[i]t is unclear what wavelength range the moiety is supposed to be transparent to." See, Office Action, page 2, 3rd paragraph. Applicants respectfully disagree with the Examiner's assertions.

The present invention provides an antireflective hardmask composition that is especially useful in conjunction with the lithographic processes used to manufacture semiconductor devices, e.g., lithographic processes employing 193 nm, 157 nm, x-ray, electron beam or other imaging

radiation. See page 14, lines 3-5 of the specification. Applicants assert on page 6, lines 4-8, of the specification, it is stated that,

each R group can be either a chromophore moiety, a transparent moiety, or a crosslinking component. The carbosilane polymer backbone itself is generally transparent to most wavelengths employed. However, the introduction of fluorine-containing moieties or SiO-containing units, which are substantially transparent to the imaging radiation, may be desirable.

Furthermore, Applicants point to page 7, lines 15-24, of the specification, wherein it is stated that,

[t]he transparent moieties may vary depending on the wavelength or character of the imaging radiation used. In the case of 193 or 157 nm lithography, the transparent moieties used are generally organic moieties free of unsaturated carbon to carbon bonds. To achieve desirable optical properties for the composition, less than or equal to about 50 percent of the transparent moieties should contain unsaturated carbon to carbon bonds, especially in the case of 193 nm lithography. In the case of 157 nm lithography, the transparent moieties may contain fluorocarbon substituents to enhance transparency. Further, the formation of polymers comprising a mixture of carbosilane and SiO-containing units may be desirable to achieve optical transparency for 193 nm and 157 nm lithography.

Given the above remarks, Applicant respectfully asserts that claims 1 and 23 distinctly provide "what wavelength range the moiety is supposed to be transparent to." Consequently, it is Applicant's position that one of ordinary skill in the art would be able to ascertain the metes and bounds of the present claims from the teachings of the specification. Thus, Applicant respectfully requests reconsideration and withdrawal of the rejection.

PRIOR ART REJECTIONS

As further highlighted above, the Examiner rejected claims 1-3, 5-12, 15, 16 and 23 under 35 U.S.C. §103(a) as allegedly being unpatentable over Apen. Specifically, the Examiner stated beginning on page 5, 5th paragraph, of the Office Action that,

since Apen states that his polycarbosilane compound is crosslinked subsequently by chemically reacting the polycarbosilane compound, it is the Examiner's position that Apen's teaching implies that his polycarbosilane compound contains a crosslinking component. Therefore, Apen's teaching renders obvious present inventions of claims 1-3, 5-12, 15 and 16 (it is the Examiner's

position that Apen's coating comprising the polycarbosilane compound would inherently be capable of being used as the present antireflective hardmask layer for lithography).

5 Applicant respectfully traverses the Examiner's rejections. To establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). Applicant respectfully submits that Apen does not teach or suggest an antireflective hardmask layer comprising a crosslinking component, as taught in claim 1 of the claimed invention. At [0022], Apen stated that,

10 a polycarbosilane-coated surface that is subjected to an energy source to chemically react the polycarbosilane compound and to subsequently crosslink the polycarbosilane compound. (Emphasis added).

15 Apen does not teach a compound comprising a crosslinking component. Further, Apen does not suggest a compound comprising a crosslinking component because Apen does not imply the inclusion of an additional component to the compound, but merely that the compound undergo a chemical reaction by being subjected to an energy source. Claim 1 of the claimed invention, however, explicitly teaches an antireflective hardmask layer comprising an actual crosslinking component. For example, on page 8, lines 10-14, of the specification, it is stated,

20 [s]uitable crosslinking components include, but are not limited to, glycoluril, alcohols, aromatic alcohols, hydroxybenzyl, phenol, hydroxymethylbenzyl for 248 nm lithography cycloaliphatic alcohols, aliphatic alcohols, cyclohexanoyl, propanol, non-cyclic alcohols, fluorocarbon alcohols, and compositions comprising at least one of the foregoing alcohols.

25 Further, on page 9, lines 1-3, of the specification, it is stated that,

[a]ccording to the teachings of the present invention, the composition may comprise from about one wt.% to about 50 wt.% on a solid basis, crosslinking component.

30 "All words in a claim must be considered in judging the patentability of that claim against the prior art." *In re Wilson*, 424 F.2d 1382, 1385, 165 USPQ 494, 496 (CCPA 1970). Therefore, because Apen does not teach or suggest a composition comprising a crosslinking component, Apen's teaching does not render obvious the present invention of claim 1.

If an independent claim is nonobvious under 35 U.S.C. 103, then any claim depending therefrom is nonobvious. *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988). Therefore, Apen's teaching does not render obvious the present invention of claims 2-3, 5-12, 15 and 16, as all depend from claim 1.

Also, the Examiner stated on page 5, 5th paragraph, of the Office Action that,

In [0047], Apen teaches that his polycarbosilane-coated surface may comprise a substrate, a dielectric material, or any other suitable material or layered material that can be used in an electronic or semiconductor application. Therefore, Apen's teaching also renders obvious present invention of claim 23.

Applicant respectfully traverses the Examiner's rejection. As with the argument above, because Apen does not teach or suggest a composition comprising a crosslinking component, and therefore Apen's teaching does not render obvious the present invention of claim 23.

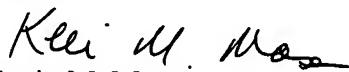
Given the above remarks, Applicants respectfully requests reconsideration and withdrawal of the rejection of claims 1-3, 5-12, 15, 16 and 23 under 35 U.S.C. §103(a) as allegedly being unpatentable over Apen.

Accordingly, Applicant submits that all claims presented here for examination, i.e., claims 1-23, are in condition for allowance and such favorable action is earnestly solicited.

If any outstanding issues remain, or if the Examiner has any further suggestions for expediting allowance of this application, the Examiner is invited to contact the undersigned at the telephone number indicated below.

The Examiner's attention to this matter is appreciated.

Respectfully submitted,



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